HAZARDOUS MATERIAL SPILL ALARM VOLTAGE DROP CALCULATION

VOLTAGE DROP CALCULATIONS: HM A1

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Gauge	per 1,000 ft	Drop
HM A1-8	0.019	0.019	35	70	14	3.26	0.0043
HM A1-7	0.019	0.038	40	80	14	3.26	0.0099
HM A1-6	0.019	0.057	100	200	14	3.26	0.0372
HM A1-5	0.019	0.076	60	120	14	3.26	0.0297
HM A1-4	0.019	0.095	35	70	14	3.26	0.0217
HM A1-3	0.019	0.114	25	50	14	3.26	0.0186
HM A1-2	0.019	0.133	60	120	14	3.26	0.0520
HM A1-1	0.019	0.152	220	440	14	3.26	0.2180
Total Load:	0.152					Total V-Drop	0.3915

23.6085 VOLTS REMAINING (within the voltage range of the appliances)
0.152 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V-RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16-33	

VOLTAGE DROP CALCULATIONS: HM V1

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Gauge	per 1,000 ft	Drop
HM A1-8	0.148	0.148	35	70	14	3.26	0.0338
HM A1-7	0.148	0.296	40	80	14	3.26	0.0772
HM A1-6	0.178	0.474	100	200	14	3.26	0.3090
HM A1-5	0.178	0.652	60	120	14	3.26	0.2551
HM A1-4	0.178	0.83	35	70	14	3.26	0.1894
HM A1-3	0.178	1.008	25	50	14	3.26	0.1643
HM A1-2	0.178	1.186	60	120	14	3.26	0.4640
HM A1-1	0.178	1.364	220	440	14	3.26	1.9565
Total Load:	1.364					Total V-Drop	3.4493

20.5507 VOLTS REMAINING (within the voltage range of the appliances)
1.364 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V-RANGE	NOTE
STROBE	WHEELOCK	NS4	75	0.148	16-33	MULTI CANDELA
STROBE	WHEELOCK	NS4	110	0.178	16-33	MULTI CANDELA

SYSTEM EVENT

RESPONSE
- ANNUNCIATE EVENT AT FACU
- TROUBLE SIGNAL TO LBNL RECEIVER
- ALARM SIGNAL TO FMCS
- OPERATE HAZ MAT NOTIFICATION APPLIANCES

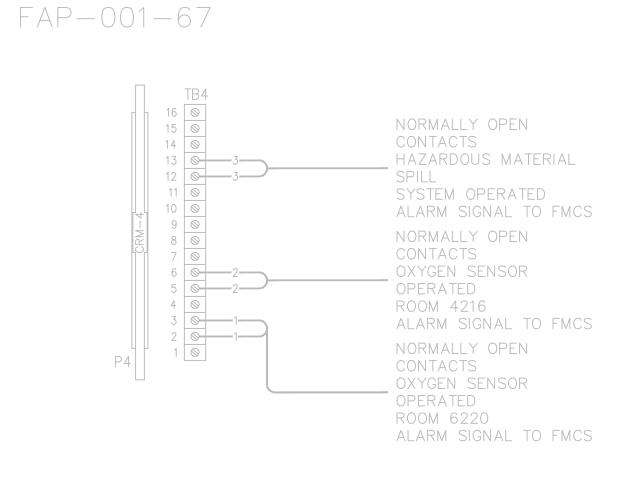| SYSTEM EVENT	ANNUNCIATE EVENT AT FACU	TROUBLE SIGNAL TO LBNL RECEIVER	ALARM SIGNAL TO FMCS	OPERATE HAZ MAT NOTIFICATION APPLIANCES
HAZARDOUS MATERIAL SPILL ALARM (CLEAN ROOM) MANUAL PULL STATION	●	●	●	●
OXYGEN SENSOR ALARM (RM 4126)	●	●	●	
OXYGEN SENSOR ALARM (RM 6220)	●	●	●	
PAD 3 TROUBLE	●	●		

NOTE 1: THIS FUNCTION CHART IDENTIFIES AUTOMATIC ACTIONS FOR THE HAZARDOUS MATERIAL SPILL ALARM AND OXYGEN SENSORS, ONLY. REFER TO THE FUNCTION CHARTS ON OTHER SHEETS FOR OTHER FUNCTIONS AND ACTIONS PERFORMED BY THE FIRE ALARM SYSTEM.
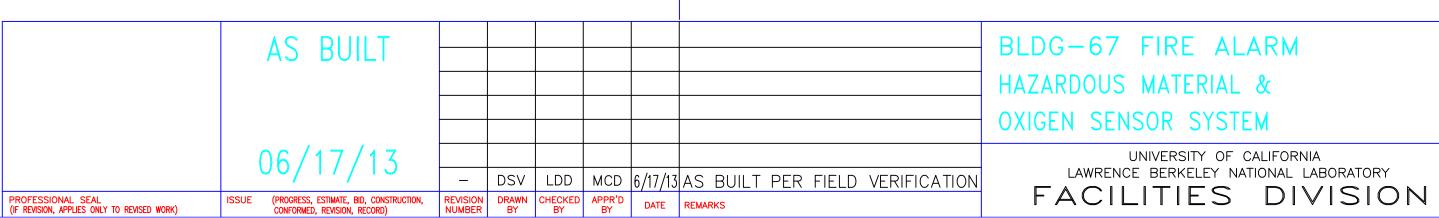
HAZARDOUS MATERIAL SPILL ALARM RISER DIAGRAM

ALD L14 FROM PREVIOUS DEVICE
ALD L14 TO NEXT DEVICE

TRI-D
L14-29
L14-30

SIEMENS PAD-3 AUXILIARY POWER SUPPLY

120 VAC

NOTES
1. ALL ALARM NOTIFICATION APPLIANCES FOR THE HAZARDOUS MATERIAL SPILL ALARM SHALL USE A BLUE COLORED LENS OVER THE STROBE.
2. THE PAD-3 SHALL BE PROGRAMMED TO PROVIDE A STEADY ALARM TONE FOR HAZARDOUS MATERIAL SPILL ALARMS.
3. THE TRI-D SHALL UTILIZE ONE SET OF CONTACTS TO OPERATE THE PAD-3. THE REMAINING SET OF CONTACTS SHALL MONITOR THE OPERATING STATUS OF THE PAD-3.
4. REFER TO DRAWING FA0.3 FOR THE SIGNALING LINE CIRCUIT RISER DIAGRAM SHOWING INITIATING DEVICES ASSOCIATED WITH THE HAZARDOUS MATERIAL SPILL ALARM SYSTEM.

HM ALARM 2ND FLOOR

110 cd	110 cd	110 cd	110 cd	110 cd	110 cd	75 cd	75 cd
HM	HM	HM	HM	HM	HM	HM	HM
HM A-1	HM A-2	HM A-3	HM A-4	HM A-5	HM A-6	HM A-7	HM A-8
HM V1-1	HM V1-2	HM V1-3	HM V1-4	HM V1-5	HM V1-6	HM V1-7	HM V1-8

FAP-001-67

TB4
16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
CSM-4
P4

NORMALLY OPEN CONTACTS HAZARDOUS MATERIAL SPILL SYSTEM OPERATED ALARM SIGNAL TO FMCS

NORMALLY OPEN CONTACTS OXYGEN SENSOR OPERATED ROOM 4216 ALARM SIGNAL TO FMCS

NORMALLY OPEN CONTACTS OXYGEN SENSOR OPERATED ROOM 6220 ALARM SIGNAL TO FMCS

AS BUILT

06/17/13

4B67E159

BLDG-67 FIRE ALARM HAZARDOUS MATERIAL & OXIGEN SENSOR SYSTEM

	DRAWN BY	DSV	DATE	05/20/2013
	CHECKED BY	LDD		7/8/2013
	APPROVED BY	MCD		7/8/2013

SCALE

-	DSV	LDD	MCD	6/17/13	AS BUILT PER FIELD VERIFICATION	

ISSUE (PROGRESS, ESTIMATE, BID, CONSTRUCTION, CONFORMED, REVISION, RECORD)
REVISION NUMBER / DRAWN BY / CHECKED BY / APPR'D BY / DATE / REMARKS

PROFESSIONAL SEAL (IF REVISION APPLIES ONLY TO REVISED WORK)

UNIVERSITY OF CALIFORNIA
LAWRENCE BERKELEY NATIONAL LABORATORY
FACILITIES DIVISION

DRAWING NO. 4B67E159
PROJECT NO. FN1438